

The Utilization of Ecobricks in Waste Management as an Effort to Reduce Plastic Waste

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ABSTRACT

The management of plastic waste presents a serious challenge in Indonesia, particularly in urban areas. This community service initiative aims to enhance students' awareness regarding plastic waste management through the Ecobrick method at SD Negeri 1 Ubung, North Denpasar District. The activity involved 30 students from class 4C and was conducted on January 24, 2025. Through this program, students were introduced to the principles of the 3R (Reduce, Reuse, Recycle) and taught how to create Ecobricks from plastic waste. The results of the activity indicated that students not only understood the importance of waste segregation but also successfully produced Ecobricks that can be used as plant pots. This program has a positive impact on fostering an environmentally conscious mindset among the younger generation. The success of the Ecobrick method at SD Negeri 1 Ubung practical its potential for implementation in other schools and can serve as a model for sustainable community-based waste management. Further community service initiatives are necessary to explore the long-term impacts of this environmental education.

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INTRODUCTION

Plastic is one of the many factors contributing to environmental degradation caused by human activities. Almost every aspect of life, from food packaging to household items, utilizes plastic, making it a serious global concern regarding low ecoliteracy and waste management, particularly plastic waste (Elvania et al., 2023). According to the Republic of Indonesia Law Number 18 of 2008 concerning waste management, waste is defined as the residuals of human daily activities and/or natural processes in solid form (Nanda & Sitorus, 2024). Plastic, as a material that is difficult to decompose naturally, poses a significant threat to the environment. According to a report from the Ministry of Environment and Forestry (KLHK), Indonesia generates approximately 6,8 million tons of plastic waste annually, with only about 9% of that amount successfully recycled. The remainder contaminates the soil, rivers, and oceans. Furthermore, Muhammad Reza Cordova, a senior researcher at the Oceanographic Research Center of the National Research and Innovation Agency (BRIN), stated that Indonesia is the second-largest contributor of plastic waste in the world (Yulianti, 2024). This indicates that plastic waste management in Indonesia is still far from optimal. The non-biodegradable nature of plastic allows it to persist in the environment for hundreds of years (Wiguna, 2023). Consequently, plastic waste accumulates and leads to various environmental issues, such as soil, water, and air

pollution (Auliyah et al., 2023). Additionally, microplastics resulting from plastic degradation have been found in the food chains of both humans and animals, posing potential health risks. If no concrete measures are taken to address this issue, it is estimated that by 2050, the amount of plastic waste in the oceans will exceed the number of fish (Permana, 2022).

Various methods have been conducted to explore solutions for plastic waste management in Indonesia. The recycling system for plastic waste in Indonesia is not functioning effectively, and public awareness regarding proper waste disposal remains low. Data indicates that only about 35% of total respondents have correctly segregated their waste (Widnyana et al., 2025). This underscores the need for efforts to raise public awareness through education and more effective waste management programs.

Waste management is one of the primary solutions to address the issue of plastic waste (Yurike et al., 2024). According to Government Regulation Number 81 of 2012, waste management in Indonesia must adhere to the principles of the 3R (Reduce, Reuse, Recycle). However, in practice, the implementation of these principles still faces numerous challenges. Many individuals lack the awareness to segregate waste at the source. Additionally, waste management infrastructure in many areas remains limited, resulting in a significant portion of waste ending up in landfills or being illegally burned, which ultimately releases harmful substances into the environment, producing toxic gas emissions such as carbon monoxide (CO) and hydrogen cyanide (HCN). In plastic waste management, all parties play a crucial role. The government is responsible for providing adequate regulations and infrastructure, while the private sector can contribute through innovative recycling technologies and the production of environmentally friendly materials (Sapthi et al., 2024).

Meanwhile, the community also plays a central role in reducing the use of single-use plastics and supporting community-based waste management programs. One innovation that is gaining popularity in plastic waste management is the utilization of Ecobricks (Aziz et al., 2022). An Ecobrick is a plastic bottle filled solidly with non-biodegradable plastic waste, forming a solid material that can be used as an alternative building material (Suidarma & Antini, 2023). This method not only reduces the amount of plastic waste but also provides a creative solution for repurposing waste into something useful. According to (Rahendaputri et al., 2020) Ecobricks have been shown to reduce plastic waste by up to 30% in communities that consistently implement this practice. The use of Ecobricks aligns with the principles of a circular economy by transforming waste into high-value products without the need for conventional recycling processes that require significant energy. Furthermore, Ecobricks can be used to create various products, from simple furniture to small structures such as playgrounds or garden walls. Thus, Ecobricks not only serve as an environmental solution but also possess social and economic potential.

Ubung Village is located in the northern part of Denpasar City, bordering several other villages in the North Denpasar District. As one of the urban areas in Denpasar, Ubung Village has a relatively high population density, with the majority of its residents being Balinese, along with some individuals from outside Bali residing in the area. Additionally, the presence of a bustling traditional market, Pasar Ubung, serves as a center for the trade of essential goods for the local community and as a meeting place for local traders and buyers from various regions. With a dense population and high economic activity, the volume of waste generated is also substantial. Although efforts have been made to raise awareness regarding waste management systems by providing organic and inorganic waste bins, many residents still do not properly segregate their waste. This is due to the perception that waste is merely useless residual material, and waste management still adheres to an end-of-pipe approach, where waste is collected, transported, and disposed of in landfills. However, the accumulation of large volumes of waste at landfill sites has the potential to release methane gas (CH₄), which can increase greenhouse gas emissions and trigger global warming (Hakim, 2019). Preventing the increase of waste accumulation at the 3R landfill in Ubung Village requires concrete steps to change mindsets and behaviors related to waste management, one of which is providing early education about types of waste, management methods, and the potential impacts in the future. Therefore, SD Negeri 1 Ubung was selected as the location for outreach activities that introduce the principles of the 3R (Reduce, Reuse, Recycle), followed by a practice of Ecobrick production as a creative solution to transform plastic waste into useful products such as pots and furniture.

The utilization of Ecobricks can significantly reduce the volume of plastic waste ending up in landfills (Andriastuti et al., 2019). By actively involving the community in the Ecobrick production process, this program not only reduces waste but also enhances skills and environmental awareness among the younger generation. This method enables the community to segregate waste more easily and efficiently, thereby increasing recycling rates. This practical that innovation in waste management is crucial for achieving better outcomes.

METHOD

This community service initiative involves simple technology, where plastic bottles are filled and compacted with plastic waste to create solid blocks that can be used as raw materials for products such as pots, tables, or chairs. The activity was conducted in class 4C at SD Negeri 1 Ubung on Friday, January 24, 2025, at 09:40 AM. Data were collected through direct observation during the activity, discussions with school officials, and documentation of the Ecobrick results from the students' practice. This research was carried out through several stages:

a. Observation

The observation phase is the initial step in this community service activity, aimed at informing and gathering information from the school regarding the planned activities at SD Negeri 1 Ubung. During this stage, data were obtained through direct discussions with the Principal of SD Negeri 1 Ubung.

b. Preparation of Materials and Tools for Ecobrick

After identifying the issues at SD Negeri 1 Ubung, the next step was to prepare educational materials related to the principles of the 3Rs (Reduce, Reuse, Recycle) and how to segregate waste. The tools and materials needed for the practice included scissors, clear tape, wood/pipes, scales, plastic bottles, and plastic waste.

c. Implementation

The implementation of this activity took place in Class 4C at SD Negeri 1 Ubung, attended by 30 students. This activity utilized a socialization method, where the 4C students were educated about the importance of waste segregation using the 3R principles and the types of waste that can be used for Ecobrick production. Following this, the students were invited to participate in a practice of Ecobrick production by following several steps: collecting and washing plastic waste until clean, cutting the plastic waste into small pieces, and filling the bottle with the plastic waste pieces until it is full and compact, ultimately forming a useful product in the form of a plant pot that is easy to make.

d. Evaluation

The final stage is the evaluation of the activity, conducted by observing the work results of the 4C students to measure their understanding of the waste segregation process and the correct Ecobrick production. The main obstacle in this community service activity was the time limitation during the compaction process of the Ecobrick bottles during the practice. However, this obstacle did not diminish the success of the activity in raising students' awareness regarding plastic waste management.

RESULTS

Plastic waste management is one of the greatest challenges faced by society today, particularly in urban areas with high population density. In Indonesia, plastic waste is a major contributor to environmental pollution, necessitating tangible efforts to mitigate its negative impacts. According to data from the Ministry of Environment and Forestry (KLHK), Indonesia generates approximately 6.8 million tons of plastic waste annually, with a significant portion ending up in landfills and contaminating the environment (Ahidin et al., 2023). This underscores the need for innovative approaches to waste management, one of which is the Ecobrick method. The Ecobrick method is a technique that transforms plastic waste into useful products, such as pots, tables, and chairs, by filling used plastic bottles with non-biodegradable waste until they are compacted.

In addition to reducing the amount of plastic waste that pollutes the environment, this method also provides an opportunity for students to actively participate in maintaining environmental cleanliness. The program aims to enhance students' awareness regarding plastic waste management and equip them with practical skills in processing waste into beneficial products. In this context, the program implemented at SD Negeri 1 Ubung, North Denpasar District, Denpasar City, represents a positive initial step in educating the younger generation about the importance of waste management. This activity involved 30 students from class 4C and took place on Friday, January 24, 2025, from 09:40 until 11:15 AM. The program provided positive education to students regarding the types of plastic waste, methods of waste segregation, and the correct process for making Ecobricks. Students not only gained theoretical knowledge but also engaged in hands-on practice in transforming plastic waste into useful products.

By introducing the concept of waste management at an early age, we can cultivate a more environmentally conscious mindset in the future. Students involved in this program are expected to become agents of change by disseminating knowledge about the importance of reducing plastic waste to their peers and families. Furthermore, they not only understand the theory but also gain direct experience in processing waste into useful items, and these skills can encourage them to be more creative in seeking solutions to waste problems in their surroundings.



Figure 1. Socialization Activity



Figure 2. Question and Answer Session

The activity began with a socialization session regarding the principles of the 3R (Reduce, Reuse, Recycle) and the methods of waste segregation that can be used as materials for Ecobrick production. During this session, all students focused on listening to the material presented. To assess the understanding of the 4C students, a question-and-answer session followed, during which the enthusiasm of the 4C students was evident as they eagerly attempted to answer the questions posed.



Figure 3. Explanation of Tools and Materials



Figure 4. Ecobrick Compaction Process

Before proceeding to the practical stage, a reiteration of the explanation regarding the tools and materials to be used in the production of Ecobricks was conducted. Subsequently, the students from class 4C were divided into two groups, and they began the Ecobrick compaction process within the bottles. This was done by filling the used plastic bottles with plastic waste until they were full and compact, thereby creating a sturdy and durable structure that can be utilized as an environmentally friendly construction material.



Figure 5. Resulting Ecobrick in the Form of a Pot

One of the tangible outcomes of this activity is the Ecobrick successfully created by the students, which was used to make plant pots as an environmentally friendly alternative. These pots not only serve as a solution for waste management but also support greening efforts within the school environment. This product practical that Ecobricks can become high-value items when managed properly. The program also positively impacts students' understanding of an environmentally friendly lifestyle, enabling them to grasp the basic concepts of Ecobrick production and produce usable products. This aligns with the notion that students' direct involvement in environmental-based projects can significantly enhance their awareness of environmental issues (Diavano, 2022). Additionally, the active involvement of teachers and the Principal of SD Negeri 1 Ubung has been a supporting factor for the success of this program. SD Negeri 1 Ubung are expected to continue managing plastic waste through the Ecobrick method, involving the entire school community. Thus, this program not only impacts the 4C students but can also be widely implemented throughout the school community.

The results of this program also highlight the relevance of early environmental education. By engaging students in activities like this, they not only learn about waste management but are also encouraged to adopt environmentally friendly habits in their daily lives. As a follow-up to this activity, it is hoped that the Ecobrick program can be expanded to other schools to encourage more communities to reduce plastic waste. Overall, the outcomes of this program that the Ecobrick method is a practical and educational solution to address plastic waste issues while enhancing environmental awareness among the younger generation. This program has a tangible impact on students and the school community and has the potential to serve as a model for sustainable community-based waste management.

This practical process provides them with direct experience that reinforces their theoretical understanding of waste management. Furthermore, project-based learning methods can enhance students' motivation and practical skills (Taliak et al., 2024). A significant outcome of this activity is the students' ability to produce pots from used plastic bottles. This product not only serves as a useful item but also symbolizes environmental awareness among students. According (Elvania et al., 2023), the use of Ecobricks in education can change students' perceptions of plastic waste and encourage them to be more concerned about environmental issues. The importance of early environmental education cannot be overlooked. By introducing waste management concepts to children, we can cultivate a more environmentally conscious mindset for the future. This emphasizes that environmental education should begin at an early age to create a generation that is more aware of ecological issues (Ismail, 2021)

Support from the school is crucial to ensure the sustainability of waste management through the Ecobrick method. However, despite the many benefits derived from this program, several challenges were encountered during the implementation of the activities. One of the main obstacles was the time limitation for the compaction process of plastic bottles into perfect Ecobricks. This highlights the need for better time planning in similar activities in the future. Overall, this activity practical that the Ecobrick method is a practical and educational solution to address plastic waste issues while enhancing environmental awareness among the younger generation. With the right support and active participation from all parties, this program has the potential to become a model for sustainable community-based waste management in Indonesia.

CONCLUSION

This program not only enhances students awareness regarding plastic waste management but also provides practical skills in processing waste into useful products through the Ecobrick method. The students practical high enthusiasm and a good understanding of the Ecobrick production process, as well as the importance of applying the 3R principles (Reduce, Reuse, Recycle) in their daily lives. This activity has a positive impact not only on the students but also on the school environment and the surrounding community. By producing Ecobricks that can be used as plant pots, students not only learn about waste management but also contribute to environmental greening efforts. This indicates that the Ecobrick method can serve as a practical solution to address plastic waste issues at the local level.

The prospects for developing the outcomes of this community service initiative are very promising. The success of this program can serve as a model to be implemented in other schools and regions across Indonesia, thereby educating more young generations about the importance of environmental conservation and reducing plastic waste. Consequently, this program will not only provide short-term benefits but also contribute to fostering a more environmentally conscious mindset in the future.

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